

Lec 1

* Why image Processing?

→ improve pictorial informations for human interpretation.

→ Processing image for:

- storage.
- transmission.
- Representation for autonomous machine.

* Image Processing

↳ input : image
↳ output : image (improved)

* Computer Vision:

↳ input : image
↳ output : interpretation for image objects.

Digital image:

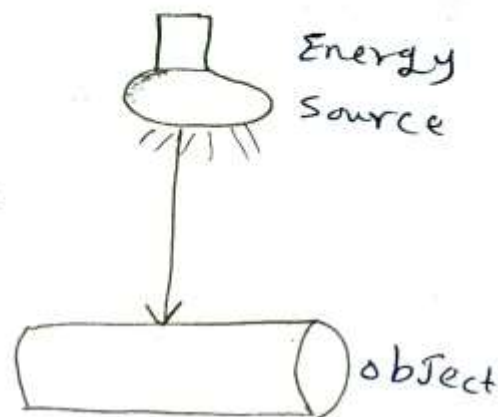
↳ matrix of pixels $P(x,y)$ where P is the intensity of pixels.

Sources of images:-

- a) Electromagnetic waves.
- b) Electronic microscope.
- c) Sound waves
- d) Computer Graphic.
- e) next Page.

How image is generated (~~image~~)

↳ object can reflect energy
or it can pass through the object
then captured by the sensor
to generate the image



* Electromagnetic waves

↳ stream of mass less particles called photons
that move with speed of light and have
a certain amount of energy.

- * Gamma - Rays.
- * X - Rays.
- * Ultra violet.
- * Visible.
- * Infra - red.
- * micro waves.
- * Radio waves.

Image - Processing and other areas.

a) Low level :

↳ output is improved image.

Ex: improve contrast, reduce noise.

b) Mid-level

↳ output is extracting features from the image.

Ex: extract characters from image.

c) High-level

↳ output: is an interpretation of the image.

Ex: interpreting characters in the image.

Applications

* Gamma-ray:

→ bone scan. → radiations from reactor valve.

→ PET Positron emission tomography.

* X-Ray

→ CAT Computerize Axial tomography to form.
(3D image)

→ checking circuit board for missing parts.

→ Aortic angiogram (image of blood vessels
using catheter) أشعة الأوعية

* Ultraviolet

↳ detect sick corn

* Visible

↳ light microscope.

* Visible / Infrared

- remote sensing. → whether forecasting & observation.
- detect bubbles in plastic.
- detect un-filled ~~bottles~~ bottle in production line.

* Micro-waves → radar

* Radio-waves

↳ MRI Magnetic resonance imaging.

* Sound waves - Geological exploration

- using plate of steel.
- making it vibrate using sound waves.
- sensing the reflecting sound.
- forming image based on distance and speed of sound and strength.

* Sonar

↳ using probe consisting of source and sensors for ultrasound wave.

Note

slide 23, 30 → check